

### Description

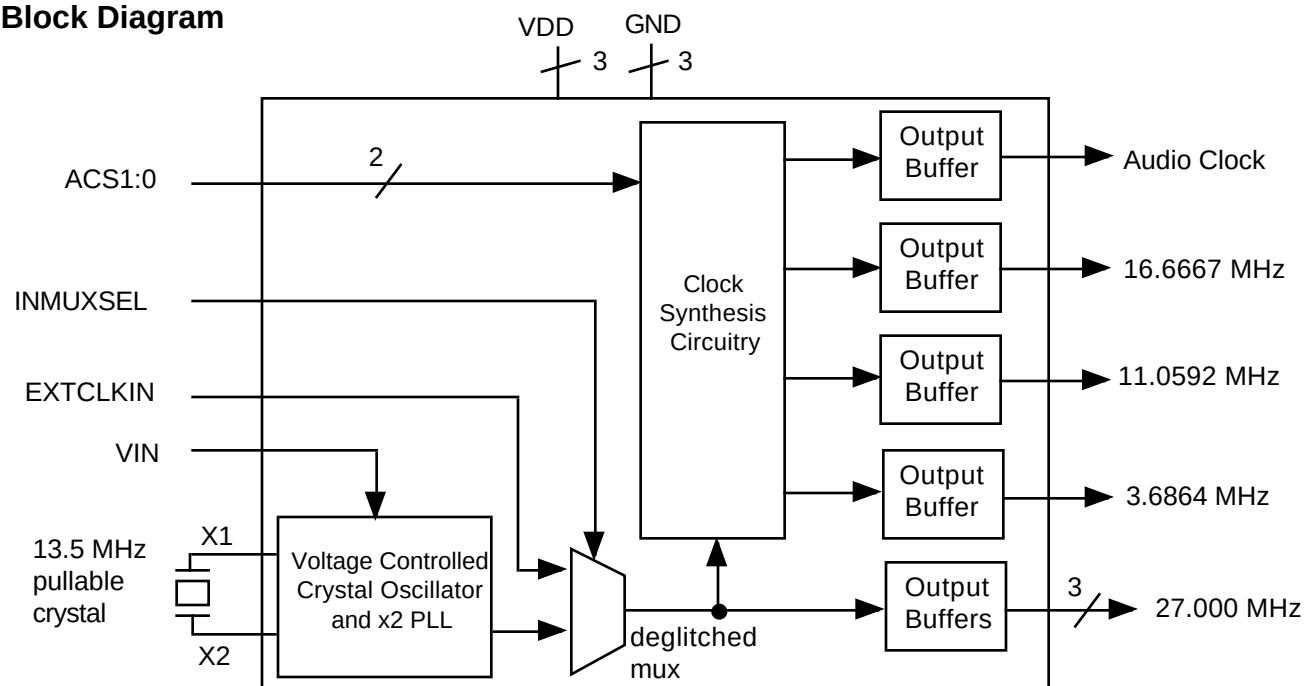
The MK2772-01 is a low cost, low jitter, high performance VCXO and clock synthesizer for set-top boxes. The on-chip Voltage Controlled Crystal Oscillator accepts a 0 to 3V input voltage to cause the output clocks to vary by  $\pm 100$  ppm. Using ICS' patented VCXO and analog Phase-Locked Loop (PLL) techniques, the device uses an inexpensive 13.5 MHz crystal input to produce multiple output clocks. All clocks are frequency locked to the 27.00MHz output (and to each other) with zero ppm error. The MK2772 includes a glitch-free multiplexer to switch input sources during operation.

ICS manufactures the largest variety of Set-Top Box and multimedia clock synthesizers for all applications. Consult ICS to eliminate VCXOs, crystals and oscillators from your board.

### Features

- Packaged in 20 pin SOIC (Pb free available)
- Uses an inexpensive 13.5 MHz crystal
- On-chip VCXO (patented) with pull range of 200ppm (minimum)
- Ability to switch input sources "on-the-fly"
- VCXO tuning voltage of 0 to 3V
- Zero ppm synthesis error (patented) in all clocks. All exactly track 27MHz VCXO
- All clocks are frequency locked. All will vary the same amount (in ppm) as the VCXO
- Selectable Audio clock for 256x, 384x, and 512x.
- 25mA output drive capability at TTL levels
- Advanced, low power, sub-micron CMOS process
- 5V operating voltage

### Block Diagram



### Pin Assignment

|        |    |    |          |
|--------|----|----|----------|
| ACS1   | 1  | 20 | ACS0     |
| X2     | 2  | 19 | EXTCLKIN |
| X1     | 3  | 18 | 27M      |
| VDD    | 4  | 17 | GND      |
| VIN    | 5  | 16 | 27M      |
| VDD    | 6  | 15 | VDD      |
| GND    | 7  | 14 | GND      |
| 16.67M | 8  | 13 | 27M      |
| 3.68M  | 9  | 12 | 11.06M   |
| ACLK   | 10 | 11 | INMUXSEL |

### Audio Clock Select

| ACS1 | ACS0 | ACLK (MHz) |
|------|------|------------|
| 0    | 0    | 8.192      |
| 0    | M    | 16.384     |
| 0    | 1    | 11.2896    |
| M    | 0    | 16.9344    |
| M    | M    | 22.5792    |
| M    | 1    | 18.432     |
| 1    | 0    | 12.288     |
| 1    | M    | 24.576     |
| 1    | 1    | 5.6448     |

### Input Source Select

| INMUXSEL | 27 MHz Input  |
|----------|---------------|
| 0        | EXTCLKIN      |
| 1        | Internal VCXO |

### Pin Descriptions

| Number | Name     | Type | Description                                                                                    |
|--------|----------|------|------------------------------------------------------------------------------------------------|
| 1      | ACS1     | TI   | Audio Clock Select 1. Determines ACLK frequency, as per table above.                           |
| 2      | X2       | X    | Crystal connection. Connect to a pullable 13.5 MHz crystal.                                    |
| 3      | X1       | X    | Crystal connection. Connect to a pullable 13.5 MHz crystal.                                    |
| 4      | VDD      | P    | Connect to +5V, and other VDDs.                                                                |
| 5      | VIN      | VI   | Voltage Input to VCXO. Zero to 3V signal which controls the frequency of the VCXO.             |
| 6      | VDD      | P    | Connect to +5V.                                                                                |
| 7      | GND      | P    | Connect to ground.                                                                             |
| 8      | 16.67M   | O    | 16.6667 MHz processor clock output.                                                            |
| 9      | 3.68M    | O    | 3.6864 MHz clock output.                                                                       |
| 10     | ACLK     | O    | Audio Clock Output determined by ACS1,0. Per table above.                                      |
| 11     | INMUXSEL | I    | Input Multiplexer Select. Selects either the internal VCXO/PLL output, or the clock on pin 19. |
| 12     | 11.06M   | O    | 11.0592 MHz clock output.                                                                      |
| 13     | 27M      | O    | 27.00 MHz clock output.                                                                        |
| 14     | GND      | P    | Connect to ground.                                                                             |
| 15     | VDD      | P    | Connect to +5V.                                                                                |
| 16     | 27M      | O    | 27.00 MHz clock output.                                                                        |
| 17     | GND      | P    | Connect to ground.                                                                             |
| 18     | 27M      | O    | 27.00 MHz clock output.                                                                        |
| 19     | EXTCLKIN | I    | External Clock Input. Connect an external 27 MHz clock to this pin for glitch free switching.  |
| 20     | ACS0     | TI   | Audio Clock Select 0. Determines ACLK frequency, as per table above.                           |

Key: I = Input, TI = tri-level input, VI = VCXO input, O = output, P = power supply connection, X = crystal connection

### Electrical Specifications

| Parameter                                           | Conditions          | Minimum | Typical  | Maximum | Units |
|-----------------------------------------------------|---------------------|---------|----------|---------|-------|
| <b>ABSOLUTE MAXIMUM RATINGS (note 1)</b>            |                     |         |          |         |       |
| Supply voltage, VDD                                 | Referenced to GND   |         |          | 7       | V     |
| Inputs and Clock Outputs                            | Referenced to GND   | -0.5    |          | VDD+0.5 | V     |
| Ambient Operating Temperature                       |                     | 0       |          | 70      | °C    |
| Soldering Temperature                               | Max of 10 seconds   |         |          | 260     | °C    |
| Storage temperature                                 |                     | -65     |          | 150     | °C    |
| <b>DC CHARACTERISTICS (VDD = 5.0V unless noted)</b> |                     |         |          |         |       |
| Operating Voltage, VDD                              |                     | 4.75    |          | 5.25    | V     |
| Input High Voltage, VIH, X1 pin only                |                     | 3.5     | 2.5      |         | V     |
| Input Low Voltage, VIL, X1 pin only                 |                     |         | 2.5      | 1.5     | V     |
| Input High Voltage, VIH                             | ACS1, ACS0          | VDD-0.5 |          |         | V     |
| Input High Voltage, VIH                             | INMUXSEL            | 2       |          |         | V     |
| Input Low Voltage, VIL                              |                     |         |          | 0.8     | V     |
| Output High Voltage, VOH                            | IOH=-25mA           | 2.4     |          |         | V     |
| Output Low Voltage, VOL                             | IOL=25mA            |         |          | 0.4     | V     |
| Output High Voltage, VOH, CMOS level                | IOH=-8mA            | VDD-0.4 |          |         | V     |
| Operating Supply Current, IDD                       | No Load, note 2     |         | 45       |         | mA    |
| Pull-up Resistor value                              | pin 11 only         |         | 250k     |         | Ω     |
| Input Capacitance                                   |                     |         | 7        |         | pF    |
| Frequency synthesis error                           | All clocks as shown |         | 0        | 1       | ppm   |
| VIN, VCXO control voltage                           |                     | 0       |          | 3       | V     |
| <b>AC CHARACTERISTICS (VDD = 5.0V unless noted)</b> |                     |         |          |         |       |
| Input Crystal Frequency                             |                     |         | 13.50000 |         | MHz   |
| Input Crystal Accuracy                              |                     |         |          | ±30     | ppm   |
| Output Clock Rise Time                              | 0.8 to 2.0V         |         |          | 1.5     | ns    |
| Output Clock Fall Time                              | 2.0 to 0.8V         |         |          | 1.5     | ns    |
| Output Clock Duty Cycle                             | At 1.4V             | 40      |          | 60      | %     |
| Maximum Absolute Jitter, short term                 |                     |         | 300      |         | ps    |
| 27 MHz output pullability, note 3                   | 0V < VIN < 3V'      | ±100    |          |         | ppm   |

Notes: 1. Stresses beyond those listed under Absolute Maximum Ratings could cause permanent damage to the device. Prolonged exposure to levels above the operating limits but below the Absolute Maximums may affect device reliability.

2. With ACLK at 12.288 MHz.

3. With a recommended crystal.

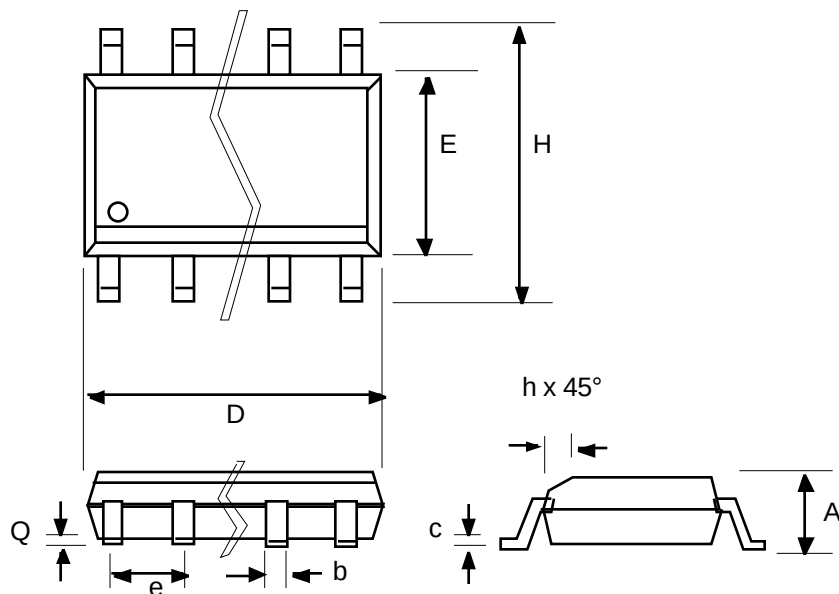
### External Components/Crystal Selection

The MK2772-01 requires a minimum number of external components for proper operation. Decoupling capacitors of 0.1μF should be connected between VDD (pin 15) and GND (14), and between VDD (4) and GND (7), as close to the MK2772-01 as possible. A series termination resistor of 33Ω may be used for each clock output. The input crystal must be connected as close to the chip as possible.

For the VCXO to operate correctly, a crystal properly specified and matched to the MK2772-01 must be used. For more information, including a list of recommended crystals, refer to application note MAN05.

### Package Outline and Package Dimensions

#### 20 pin SOIC



| Symbol | Inches   |       | Millimeters |        |
|--------|----------|-------|-------------|--------|
|        | Min      | Max   | Min         | Max    |
| A      | 0.092    | 0.104 | 2.3368      | 2.6416 |
| b      | 0.014    | 0.019 | 0.356       | 0.483  |
| c      | 0.009    | 0.012 | 0.229       | 0.305  |
| D      | 0.490    | 0.512 | 12.446      | 13.005 |
| E      | 0.290    | 0.300 | 7.366       | 7.620  |
| H      | 0.394    | 0.419 | 10.008      | 10.643 |
| e      | .050 BSC |       | 1.27 BSC    |        |
| h      |          | 0.016 |             | 0.406  |
| Q      | 0.003    | 0.011 | 0.076       | 0.279  |

### Ordering Information

| Part/Order Number | Marking      | Shipping packaging | Package     | Temperature |
|-------------------|--------------|--------------------|-------------|-------------|
| MK2772-01S        | MK2772-01S   | tubes              | 20 pin SOIC | 0-70°C      |
| MK2772-01STR      | MK2772-01S   | tape and reel      | 20 pin SOIC | 0-70°C      |
| MK2772-01SLF      | MK2772-01SLF | tubes              | 20 pin SOIC | 0-70°C      |
| MK2772-01SLFTR    | MK2772-01SLF | tape and reel      | 20 pin SOIC | 0-70°C      |

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